

A RE-ASSESSMENT OF THE TERTIARY ECHINOID GENUS *GONIOSIGMA* FELL 1964

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ABSTRACT: The holotype of the New Zealand temnopleurid *Echinus enysi* Hutton, type species of *Goniosigma* Fell 1964 is described and figured. As a consequence *Asaphechinus* Philip 1969 is regarded as a junior synonym, and the following four Australian Tertiary species are referred to *Goniosigma*: *Asaphechinus murrayensis* Philip, *A. princeps* Philip, *A. singletoni* Philip, *A. tasmanensis* Philip.

INTRODUCTION

The Tertiary temnopleurid genus *Goniosigma* Fell 1964 was proposed for *Echinus enysi* Hutton 1873, from Oligocene strata of the Trelissic Basin, New Zealand. In describing the Tertiary temnopleurids from SE. Australia (Philip 1969, pp. 248-249) only passing reference was made to this genus, for, from the description of the genus, no close relationship appeared to exist with Australian forms. Through the courtesy of Dr. G. R. Stevens, of the Geological Survey of New Zealand, it has now been possible to study the holotype of *Echinus enysi* Hutton and an additional specimen identified as *Goniosigma enysi* in the Geological Survey's collections. The purpose of this note is to redescribe and illustrate this material and, on this basis, comment on the relationships of the genus.

SYSTEMATIC DESCRIPTION

Genus *Goniosigma* Fell

Type Species *Echinus enysi* Hutton 1873

DESCRIPTION OF HOLOTYPE: Geol. Surv. N.Z. EC272 (Pl. A, fig. 2-3, 6).

Test fragmentary, with adapical portion largely missing and with most of peristome obscured by matrix. Comparatively large and depressed with a flattened adoral surface somewhat sunken around the peristome. Gill slits (revealed by preparation) small and sharp and prominently buttressed by a ridge.

Ambulacra slightly greater than half of the width of the interambulacra. Poriferous tract narrow, with the pore-pairs in each triad distinctly arcuate. The primary ambulacral tubercles form a regular vertical series and are mounted close to the poriferous tract. A small secondary tubercle is mounted between the median pore-pair of each triad and its primary tubercle. Elsewhere the secondary tubercles tend to

be irregular although towards the ambitus a slightly enlarged secondary tubercle may be present inside the primary ambulacral tubercles. The pores within each pore-pair are equal in size.

The interambulacral plates possess small median primary tubercles similar in size to the corresponding ambulacral tubercles. A horizontal series of slightly enlarged secondary tubercles is present along the middle of each plate. Beneath the ambitus, these secondary tubercles are more enlarged and prominent. The remainder of the surface of the plates is covered with irregular granules which may coalesce to form vermiculate ridges parallel to the median suture. Both the median ambulacra and interambulacral sutures tend to be bare above the ambitus.

Although the test is worn and has poorly preserved surface detail, the primary ambulacral and interambulacral tubercles are coarsely crenulate and their bosses are irregularly scalloped.

DESCRIPTION OF GEOL. SURV. N.Z. EC697 (Pl. A, fig. 1, 4-5).

LOCALITY: 'Trig M, near Totara, Oamaru', from tuffs under Oamaru Limestone.

DESCRIPTION: Test well preserved but broken and lacking apical system and one-third of adoral surface. Test moderately large and depressed with a flattened adoral surface sunken around the peristome. Gill slits small, sharp and well buttressed. Perignathic girdle poorly preserved and broken but consisting of low apophyses connecting wide, high auricles apparently united above the ambulacra.

Ambulacra approximately half of the width of the interambulacra. Poriferous tract narrow with the pore-pairs of each triad arranged in obscure arcs which become more pronounced toward the ambitus. The primary ambulacral tubercles are small and are mounted adjacent to the poriferous tract where they form a regular vertical series. The secondary tubercles are irregularly disposed and the median suture is bare down to the ambitus.

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MEASUREMENTS:

No.	h.d.	v.d.	Diameter apical system	Diameter peristome	No. amb.	No. interamb.
EC272	29.0 mm	c. 16.0 mm	—	—	c. 23 (24)	c. 18 (19)
EC697	19.5	11.0	5.5 mm	8.5 mm	16 (17)	13 (14)

The interambulacral plates possess median primary tubercles similar in size to the corresponding ambulacral tubercles. A horizontal series of slightly enlarged secondary tubercles is present along the middle of each plate. At and beneath the ambitus these become more prominent. The remainder of the surface of the plates is covered with tubercles and irregular granules which become more crowded toward the ambitus. Adapically the median interambulacral suture tends to be bare.

The tubercles are coarsely crenulate and the bosses of the primary tubercles tend to be scalloped.

REMARKS:

1. The tubercles of the holotype of *Echinus enysi* Hutton are not smooth (as described by Fell 1964) but are coarsely crenulate.

2. Although the nature of the apical system and of the girdle cannot be determined from the holotype, the ambulacra, gill-slits and ornament closely ally the species with *Asaphechinus murrayensis* Philip, the type species of *Asaphechinus* Philip 1969.

3. As a consequence, *Asaphechinus* is here regarded as a subjective junior synonym of *Goniosigma* Fell 1964.

4. The following Australian Tertiary temno-pleurid species are here transferred to *Goniosigma*:

Asaphechinus murrayensis Philip 1969, pp. 242-243, Pl. 5, fig. 1-4, 6-7, 12; Pl. 12, fig. 5; Text-fig. 2a-c, e-g.

Asaphechinus princeps Philip 1969, pp. 243-244, Pl. 5, fig. 8-10; Pl. 12, fig. 5; Pl. 14, fig. 1-3; Text-fig. 3c, e, g.

Asaphechinus singletoni Philip 1969, pp. 244-246, Pl. 6, fig. 1-4, 8-12; Pl. 12, fig. 3-4; Pl. 13, fig. 4; Text-fig. 3a-b, f, h-i.

Asaphechinus tasmanensis Philip 1969, Pl. 6, fig. 5-7; Pl. 15, fig. 2; Text-fig. 8g-h, j.

5. *Goniosigma enysi* resembles most closely the Australian species *G. princeps*, but differs in that

- the test is sunken around the peristome,
- the pores in each pore-pair are of similar size,
- the subambital secondary interambulacral tubercles are not so large.

6. *G. princeps* may show vermiculate granules forming ridges parallel to the median interambulacral suture, the feature on which Fell based the genus *Goniosigma* (cf. Philip 1969, Pl. 5, fig. 10). The feature is variable and does not occur in all specimens of *G. princeps*. Moreover it does not occur in all species of *Goniosigma*.

7. A second specimen in the collections of the Geological Survey of New Zealand (EC697) was identified by Fell as *Goniosigma enysi*.

8. In this specimen the pore-pairs are not markedly arcuate. However the nature of the perignathic girdle is suggestive of *Asaphechinus* (= *Goniosigma*) rather than *Cryptechinus*. The specimen would appear to represent a species close to *G. tasmanensis*, but further material is necessary for the species to be properly determined. For the present it is identified *Goniosigma* ? sp. indet.

REFERENCES

- FELL, H. B., 1964. Oligocene echinoids from the Trelissic Basin, New Zealand. *Trans. R. Soc. N.Z.* 4 (15): 201-205, Pl. 1-4.
- PHILIP, G. M., 1969. The Tertiary echinoids of south-eastern Australia IV. Camarodonta (2). *Proc. R. Soc. Vict.* 82 (2): 233-275, Pl. 3-16.

EXPLANATION OF PLATE 12

Figures $\times 1.5$ approximately, unless otherwise stated

- FIG. 2-3, 6—*Goniosigma enysi* (Hutton). (2) Lateral; (3) Adapical view of holotype, N.Z. Geol. Surv. EC272; (6) Enlargement of superambital ornament, $\times 10$ approx.
- FIG. 1, 4-5—*Goniosigma* ? sp. indet. (1) Lateral; (2) Adapical view of N.Z. Geol. Surv. EC697; (5) Enlargement of superambital ornament, $\times 10$ approx.